

NO. 26. SPECTROPHOTOMETRIC RECORDS FROM 0.3-0.55 μ
FOR SOME A AND B STARS
WITH SPECIAL REFERENCE TO THE BALMER SERIES*

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May 21, 1963

ABSTRACT

Direct intensity tracings are given for four stars, showing the profiles of the Balmer lines and their merging toward the Balmer continuum. These records are intended for purposes of comparison with similar tracings of the Paschen and Brackett series.

During a recent run with the 36-inch telescope of the Kitt Peak National Observatory, an opportunity existed to record the Balmer series of four A and B stars for comparison purposes with the Paschen and Brackett series discussed in *Communications No. 25*. The records cover α Virginis (B3), 0.3-0.54 μ ; α Leonis (B8), 0.3-0.4 μ ; α Lyrae (A0), 0.3-0.56 μ ; and α Cygni (cA2), 0.3-0.4 μ . It will be possible later to add α Canis Majoris and β Orionis, described in *Communications No. 25*. Meanwhile, α Lyr may serve as a substitute for α CMa.

The same spectrometer was used as for the IR records described in *Communications No. 25*, but now equipped with a 1200-line/mm Bausch and Lomb grating, blazed for 1 μ . It was used in the third order for 0.3-0.4 μ and in the second order for 0.4-0.6 μ . The detector was a Dumont S13 photomultiplier (having an S4-type photo-surface and a quartz window). The resolution obtained was about 2A for $\lambda < 0.4\mu$, 4A for $\lambda > 0.4\mu$, sufficient for a fair portrayal of the Balmer profiles.

The photometric records obtained are reproduced photographically in Figures 1-14. Where possible, two records of each region are given to allow verification of detail. Identifications and wavelengths were taken from published lists by Wyse

(1938), Struve (1939), Struve and Swings (1941), Rush (1942), and Underhill (1948*a, b*). Reference is made also to Merrill (1956) for a general bibliography of stellar absorption lines, and to Buscombe (1951) for a catalog of equivalent widths of absorption lines in α Cyg (and the A1 star γ Gem) between 3300-4700A.

The principal aim of the records is to portray the profiles of the Balmer lines H β -H ζ , the merging of the higher members, different for main sequence stars and the supergiant α Cyg, and the prominence of the Balmer continuum. Owing to instrumental broadening, the profiles of the weaker lines are not shown correctly, although the equivalent widths will in principle be correct. For two of the stars, α Cyg and α Lyr, photometric records of higher resolution, derived from McDonald coude plates for $\lambda > 0.39\mu$, were published by Hiltner and Williams (1946).

The Balmer lines are well shown to the upper state $n=17$ or 18 for α Vir, to $n=17$ for α Leo, $n=20$ for α Lyr (but the record is better than for α Leo), and to $n=24$ for the supergiant α Cyg, with lines up to $n=28$ possibly present. Some equivalent widths of Balmer lines have been used in *Communications No. 25* for comparisons with the Paschen and Brackett lines.

*Kitt Peak Nat. Obs., Cont. No. 33.

The telluric ozone bands are especially well shown in the B star α Vir. Reference is made to the work by Vigroux (1953) and the compilation by Gast in the *Handbook of Geophysics* (1960) for the absorption coefficient of O_3 as a function of wavelength.

Our appreciation is due to Dr. Mayall and the staff of Kitt Peak National Observatory for granting the observing time with the 36-inch telescope. I am indebted to Dr. H. L. Johnson for advice on the electronic system used in obtaining the present records; to Mr. A. Binder and Mr. E. Whitaker, who assisted with the observations; and to Mrs. Linda Scheer, who with meticulous care mounted the tracings for reproduction. The spectrometer program is supported by the National Aeronautics and Space Administration under Grant NsG 161-61.

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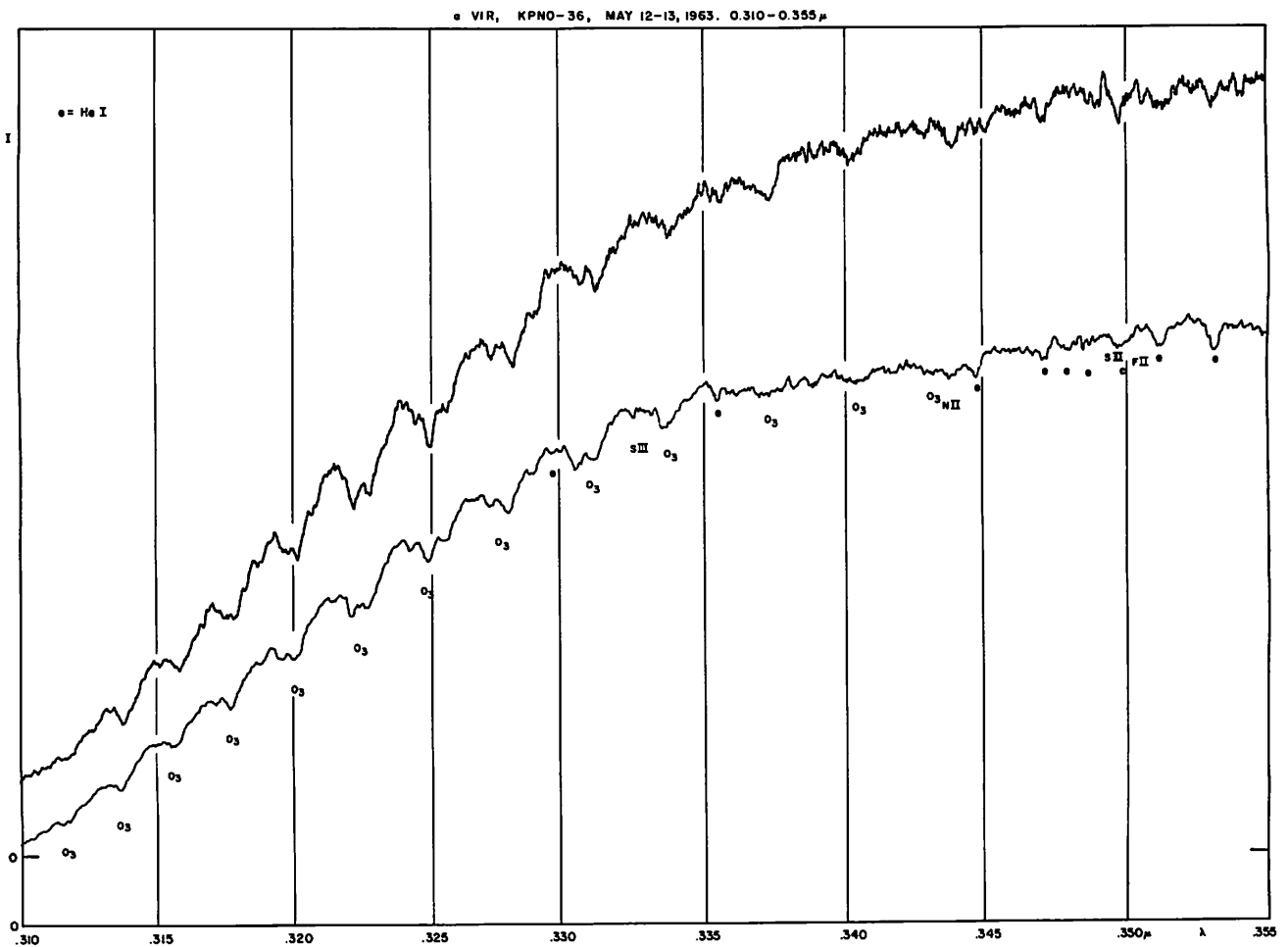


Fig. 1.— α Virginis, Kitt Peak National Observatory, 36-inch telescope, 0.310-0.355 μ . Grating 1.0 μ , 1200 lines/mm, third order, Corning 9863 filter, S13 cell, $\tau = 2$ seconds, scanning times 15 minutes. Upper: May 12, 1963, 0.25 mm analyzing slit, air mass 1.73. Lower: May 13, 1963, 0.5 mm slit, air mass 1.43.

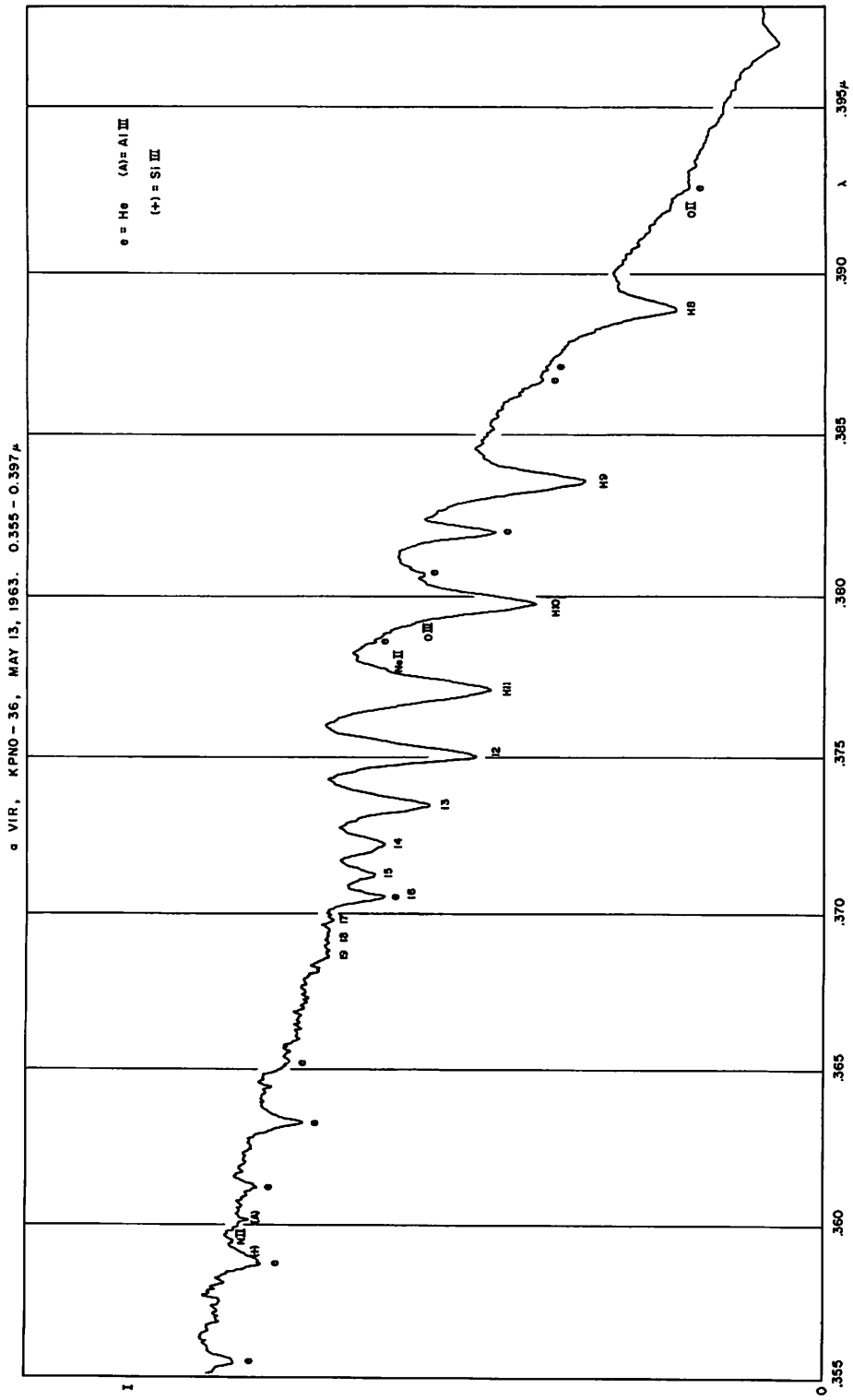


Fig. 2.— α Virginis, 0.355-0.397 μ , May 13, 1963. As Figure 1, 0.5 mm slit.

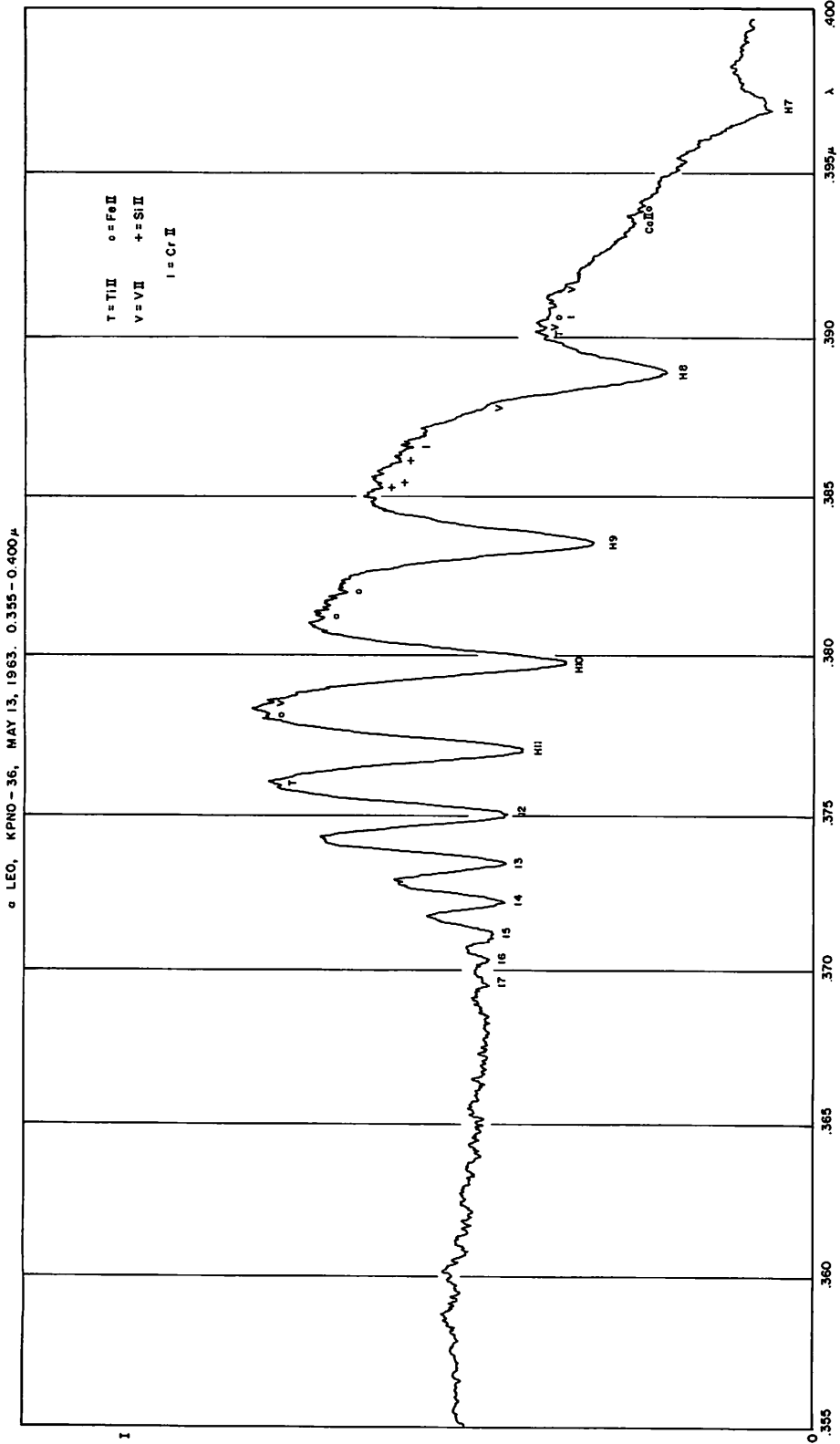


Fig. 4.— α Leonis, 0.355-0.400 μ , May 13, 1963. As Figure 1, 0.5 mm slit.

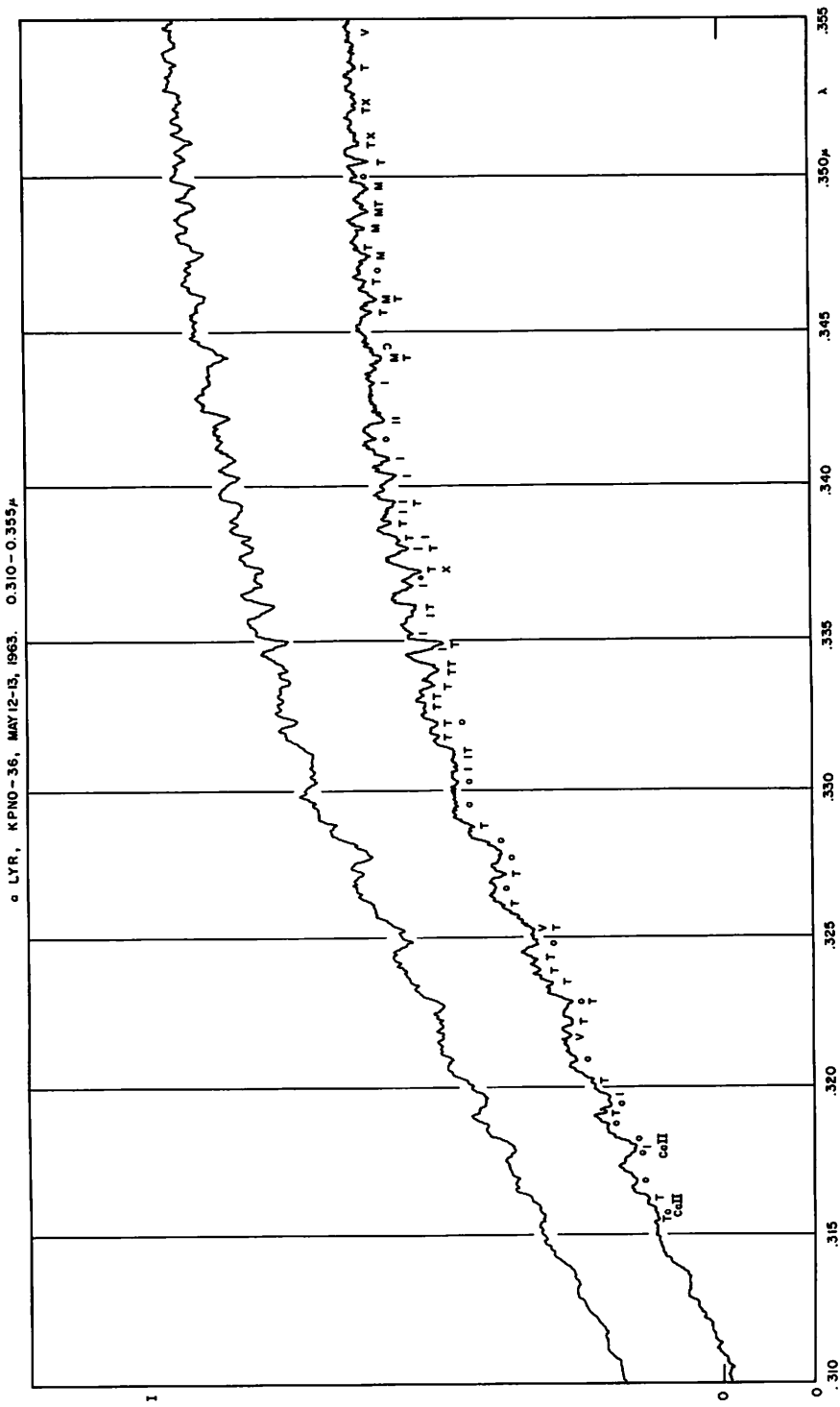


Fig. 5.— α Lyrae, 0.310-0.355 μ . As Figure 1. *Upper*: May 13, 1963, 0.5 mm slit, air mass 1.03. *Lower*: May 12, 1963, 0.25 mm slit, air mass 1.01. See Figure 8 for the symbols used, and Figures 1 and 3 for the O_3 positions.

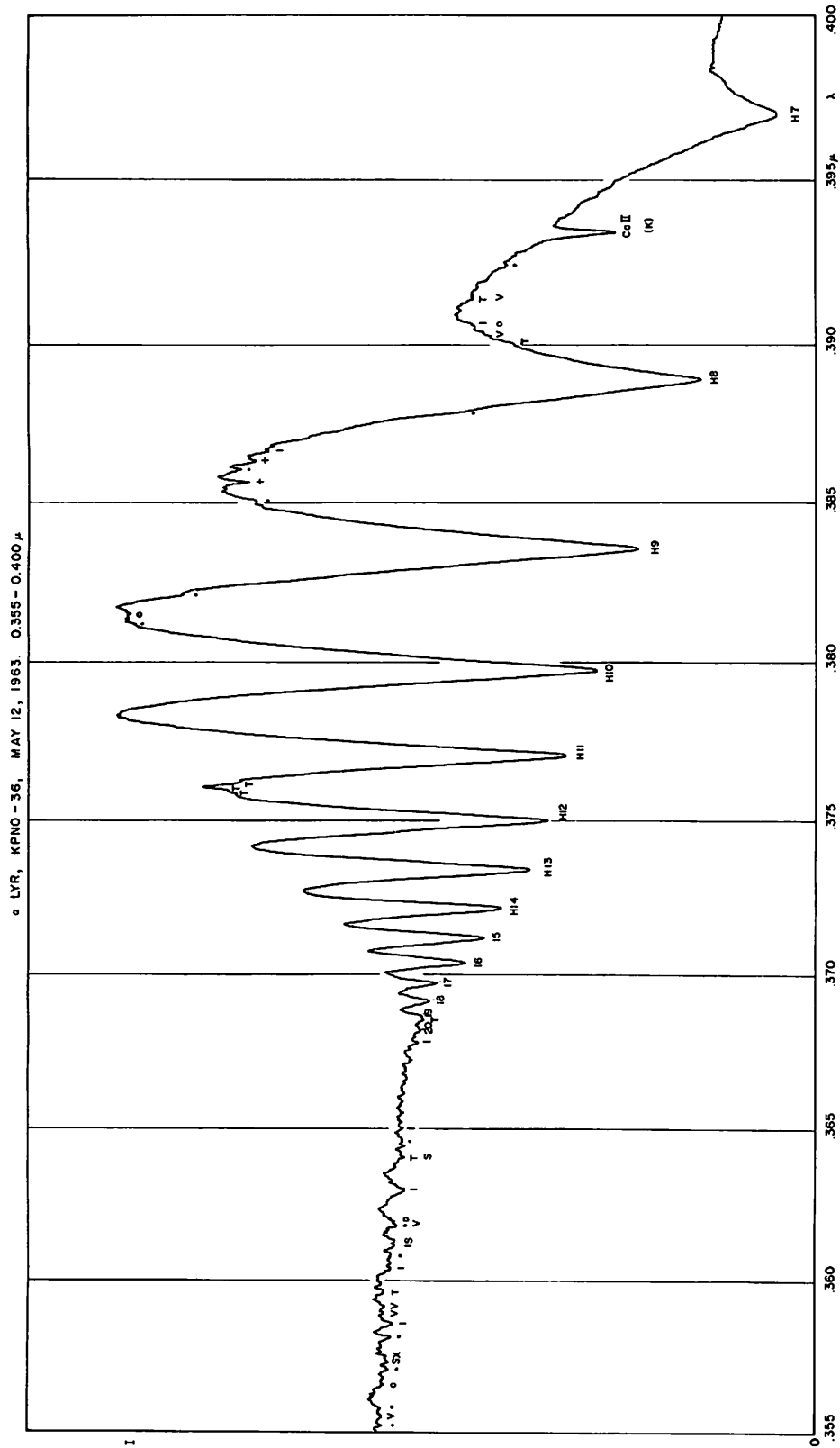


Fig. 6.— α Lyrae, 0.355-0.400 μ , May 12, 1963. As Figure 1, 0.25 mm slit. See Figure 8 for the symbols.

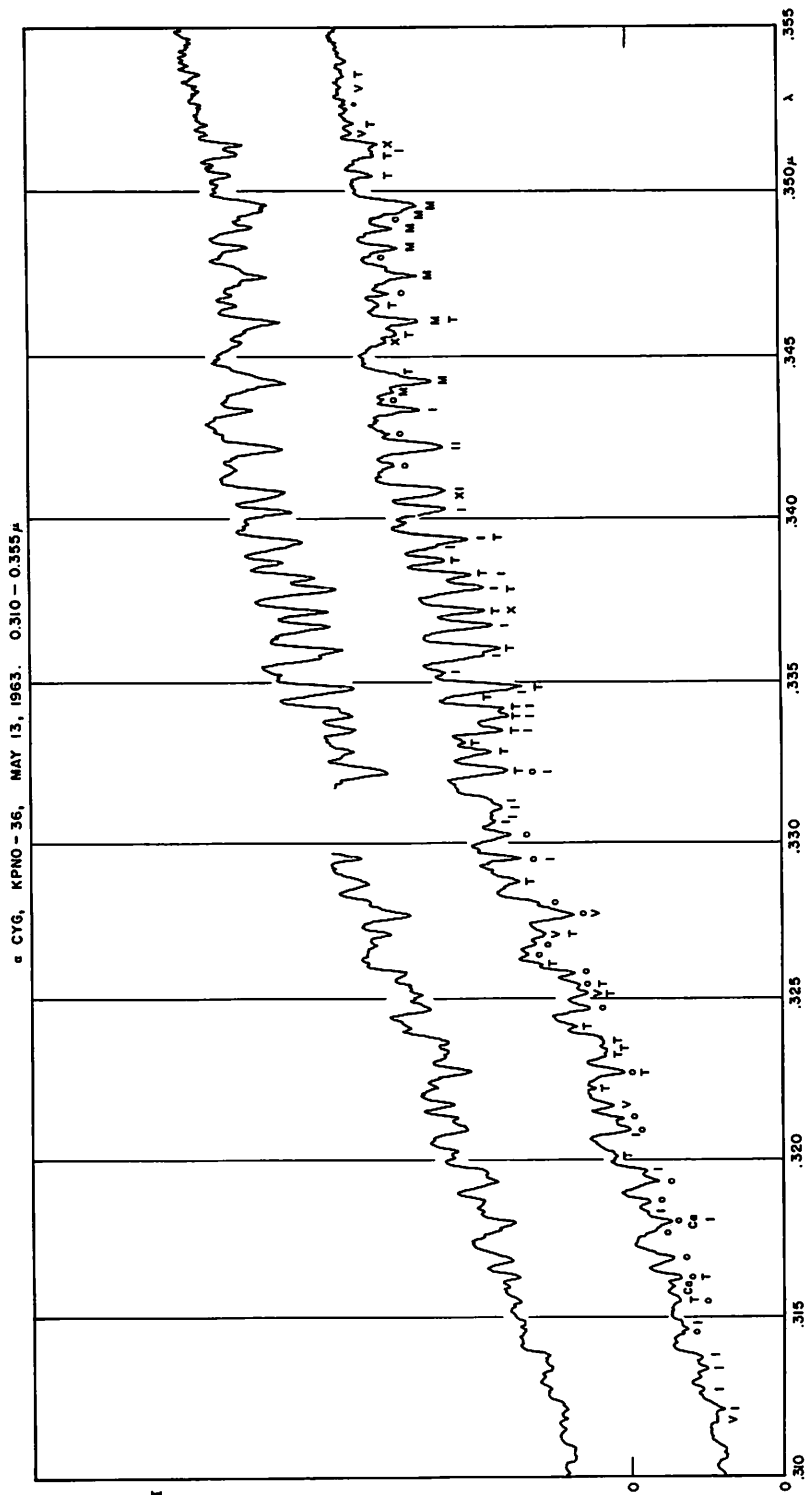


Fig. 7.—α Cygni, 0.310-0.355μ, both May 13, 1963. As Figure 1, 0.5 mm slit, air mass 1.18 (*upper*), 1.24 (*lower*). See Figure 8 for the symbols, and Figures 1 and 3 for the O₃ positions.

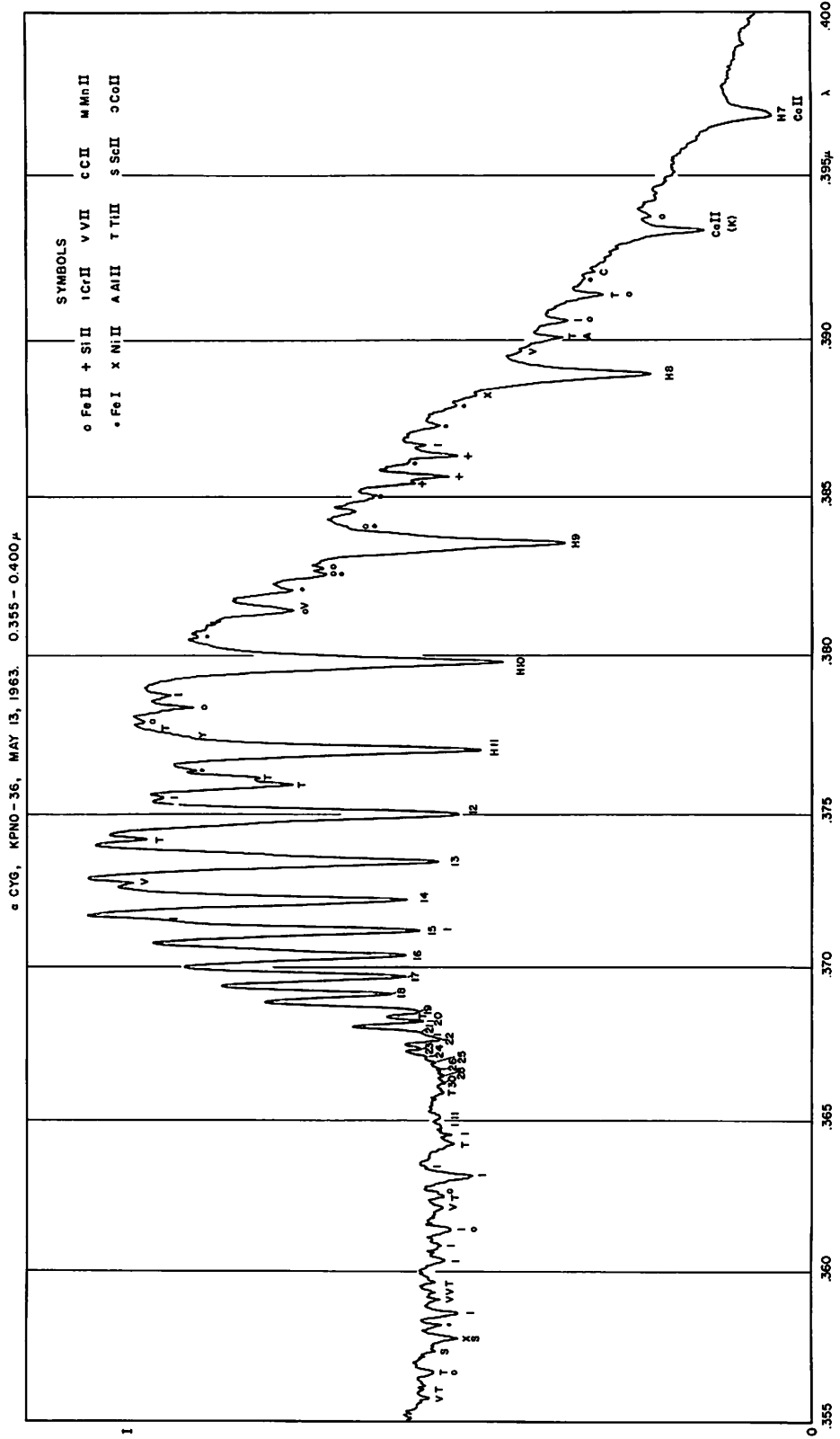


Fig. 8.— α Cygni, 0.355-0.400 μ , May 13, 1963. As Figure 1, 0.5 mm slit.

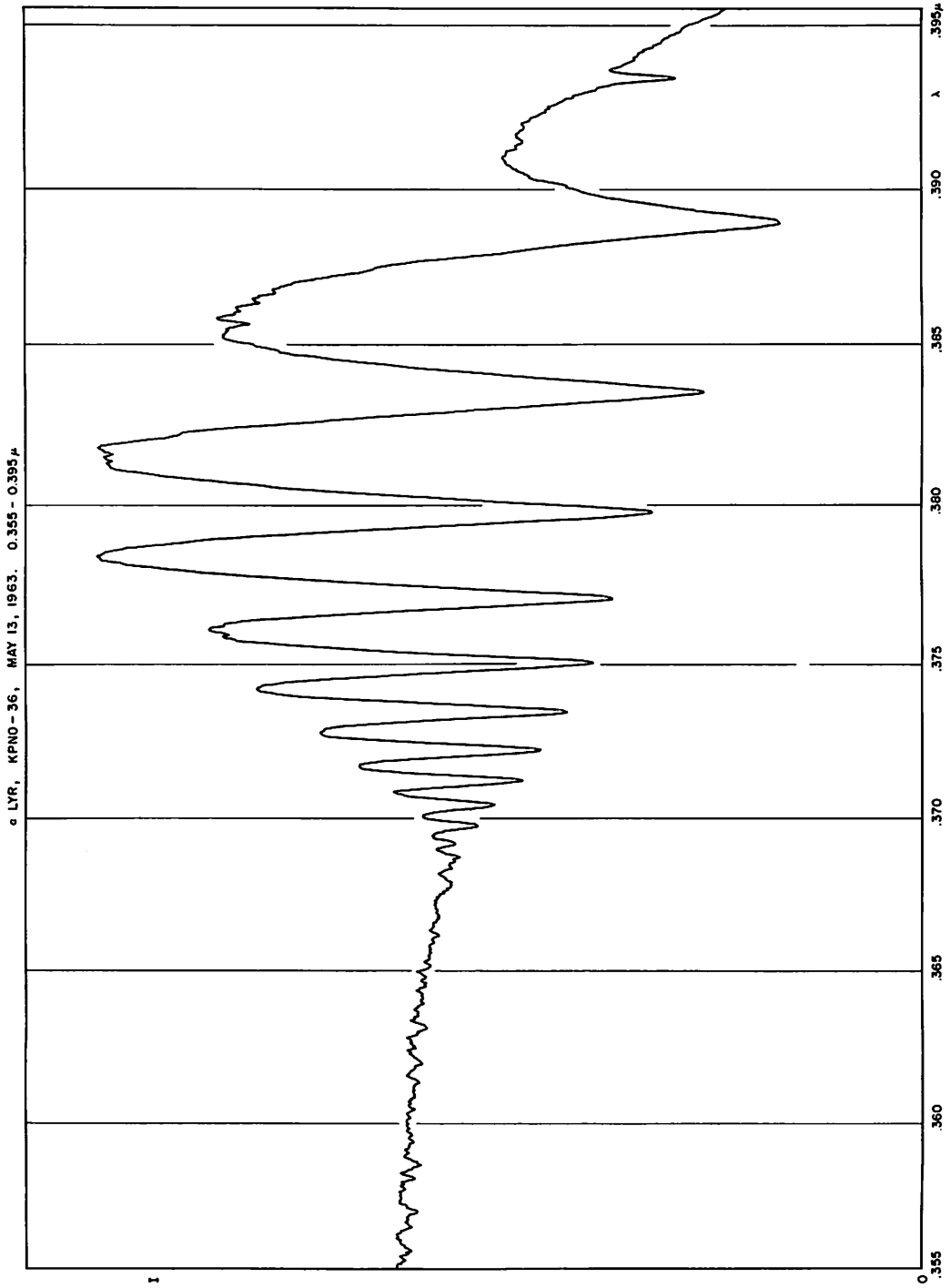


Fig. 9.— α Lyrae, 0.355-0.395 μ , May 13, 1963. As Figure 6, 0.5 mm slit, second run.

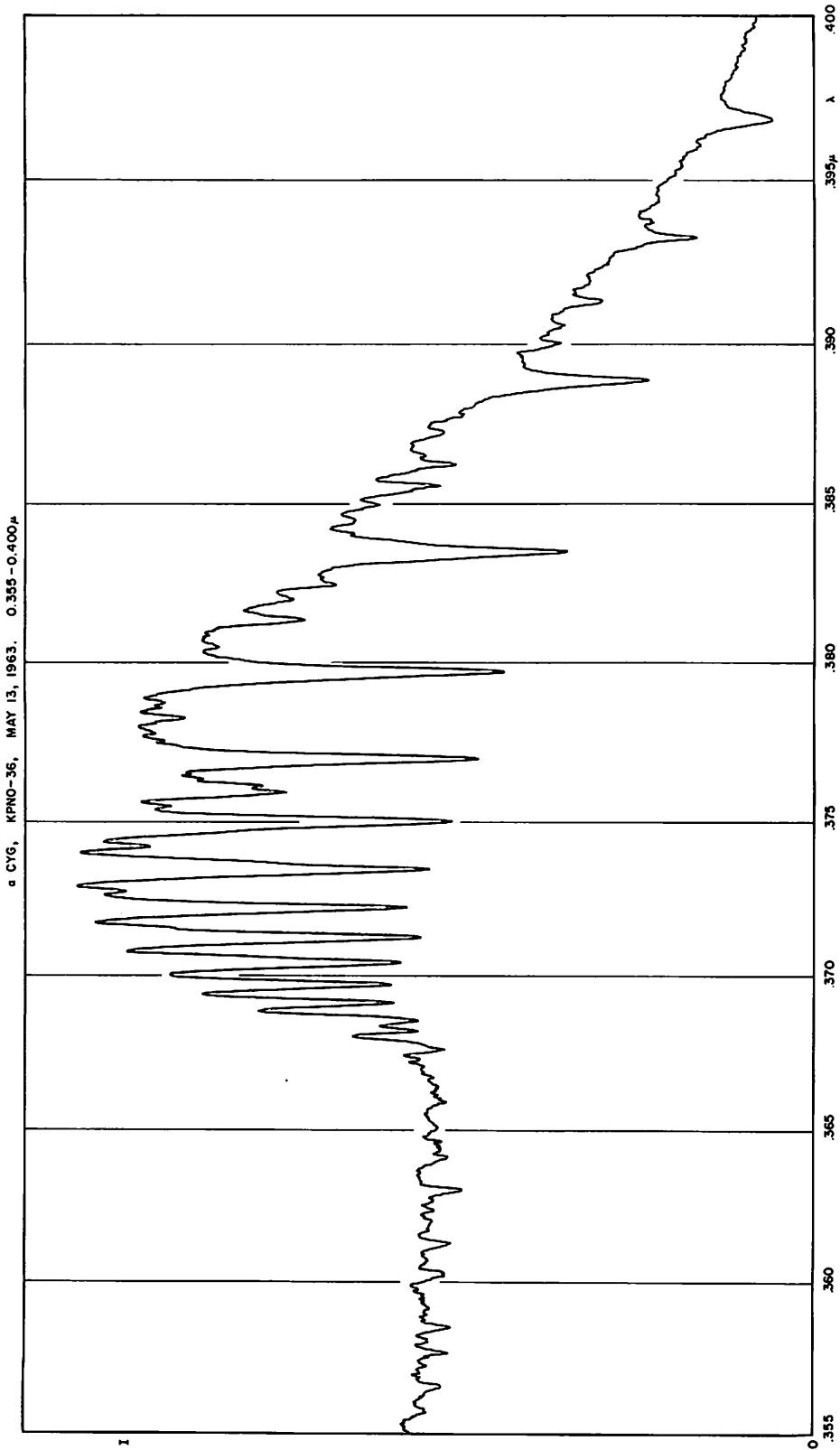


Fig. 10.— α Cygni, 0.355-0.400 μ , May 13, 1963. As Figure 8.

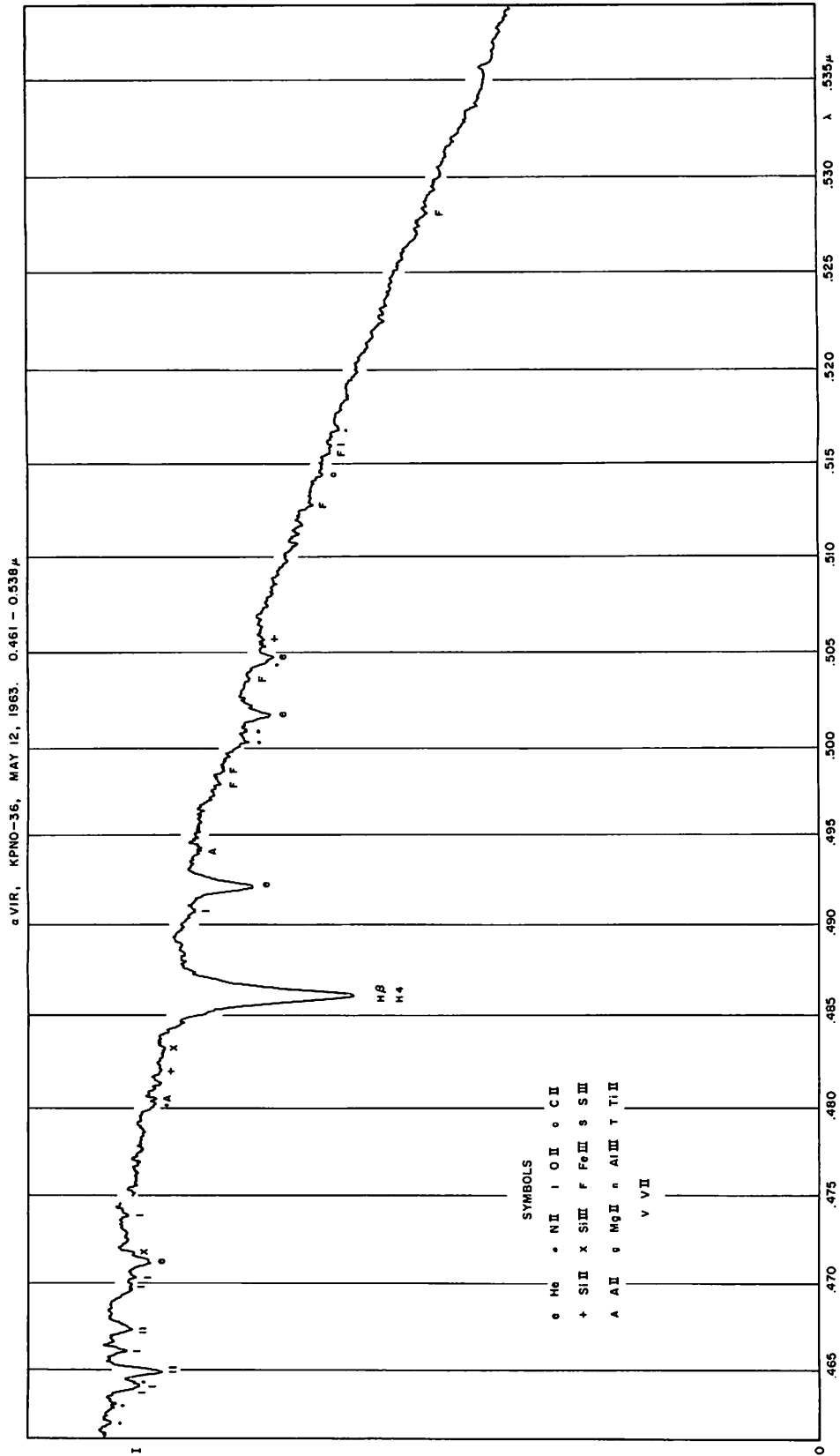


Fig. 12.— α Virginis, 0.461-0.538 μ , May 12, 1963. As Figure 11.

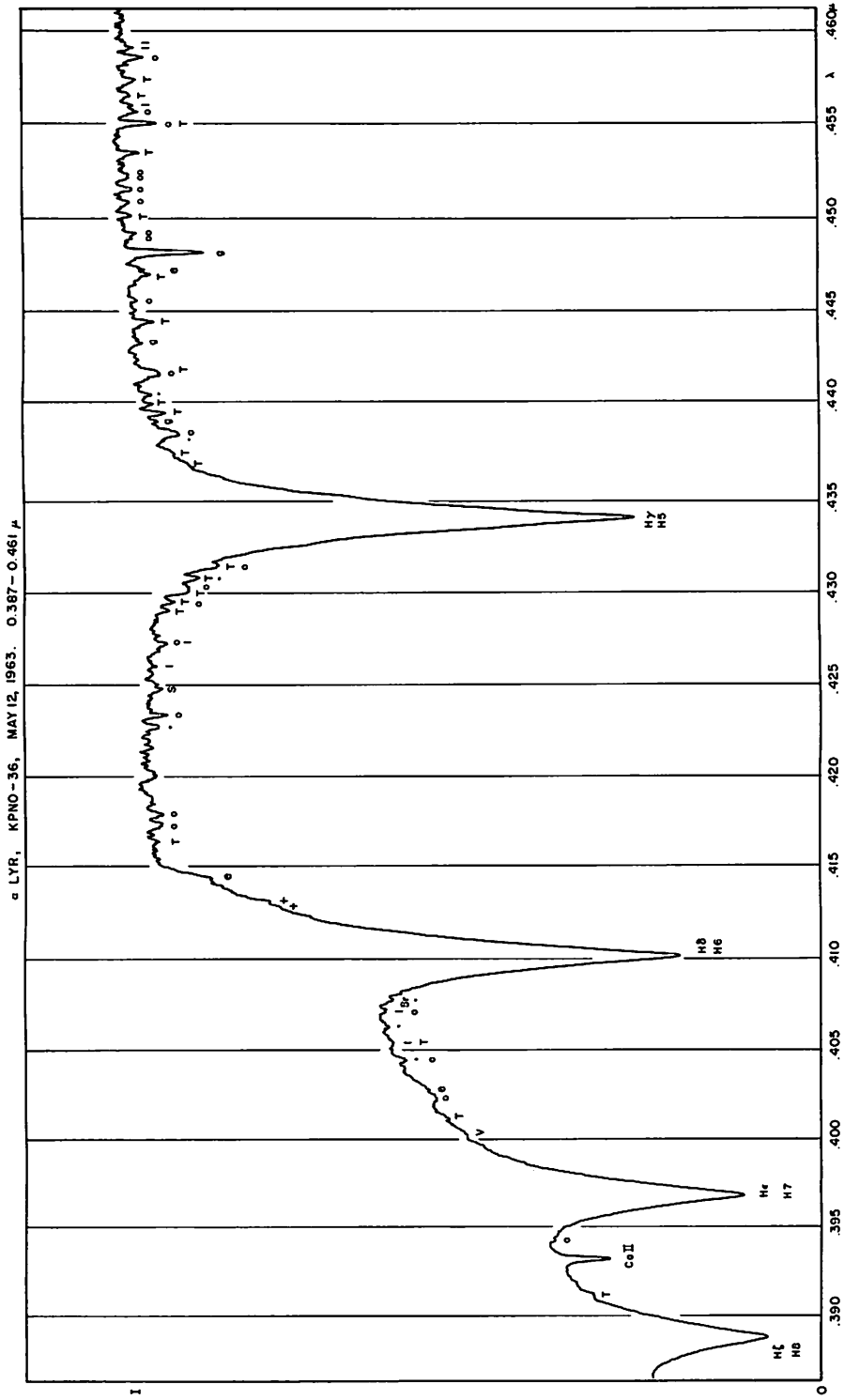


Fig. 13.— α Lyrae, 0.387-0.461 μ , May 12, 1963. As Figure 11. See Figure 14 for the symbols.

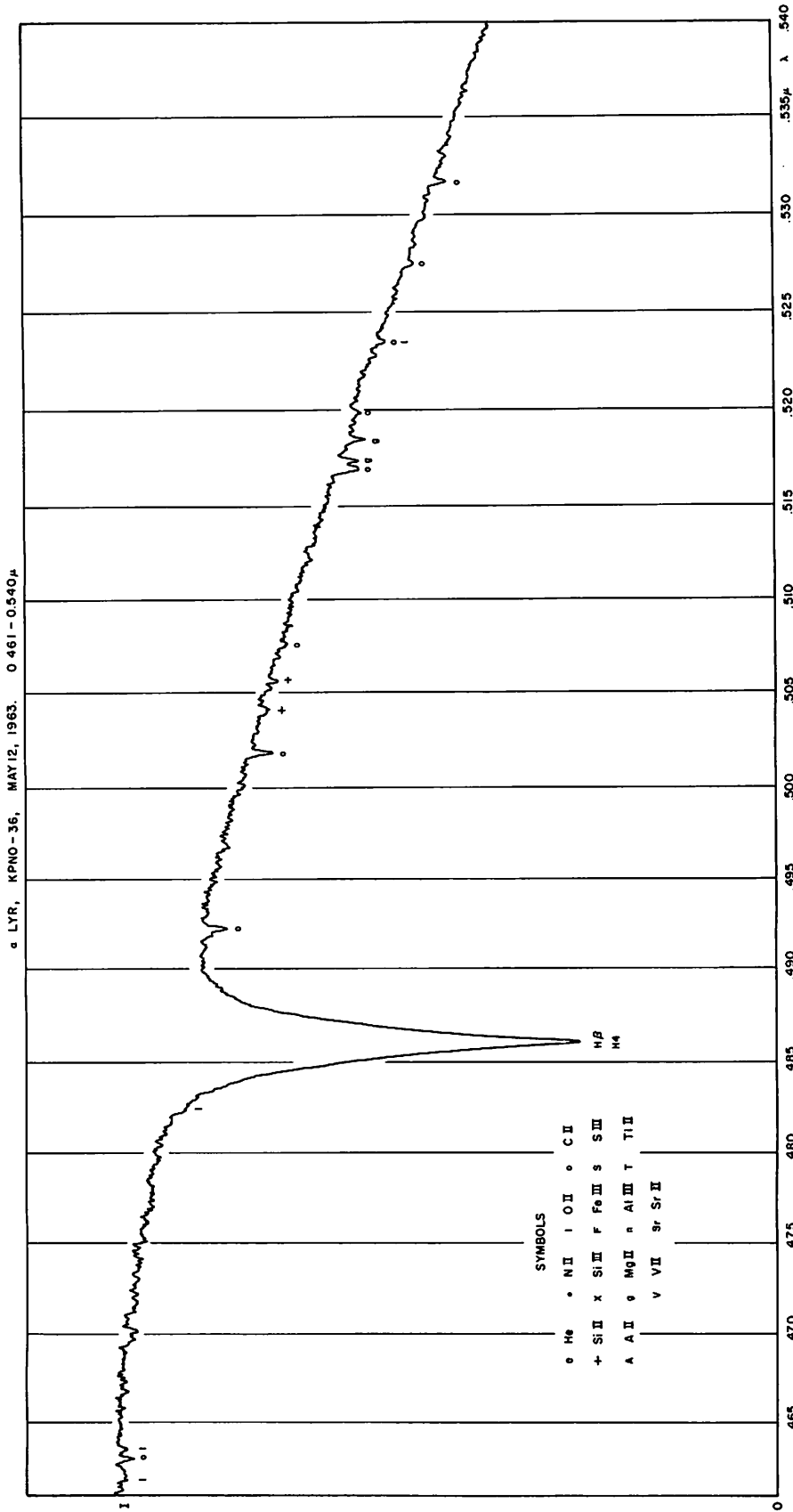


Fig. 14.— α Lyrae, 0.461-0.540 μ , May 12, 1963. As Figure 11.